The invention concerns an intervertebral stabilising device, designed to link two neighbouring vertebrae (2, 2'), characterised in that it comprises an upper stop element (26), integral with the upper vertebra (2) and a lower stop element (34) integral with the lower vertebra (2') said extra-disc stop elements (26, 34) having mutual support surfaces (26', 38) adapted to allow a mutual rotation of said upper (2) and lower (2') vertebrae about the patient’s transverse and sagittal axes, and to prevent a mutual rotation of said two vertebrae about a vertical axis, said support surfaces being further adapted to allow mutual translation said vertebrae in a single direction along the sagittal axis, to allow translation between said two vertebrae in both directions along the vertical axis, and to prevent translation between said two vertebrae in both directions along the transverse axis.
Fig. 1
INTERVERTEBRAL STABILIZING DEVICE

[0001] The present invention concerns an intervertebral stabilizing device.

[0002] The invention proposes to produce such a device, which makes it possible to restore the stability between two adjacent vertebrae when the posterior intervertebral articulation has been totally or partially destroyed because of surgery or even from a disease.

[0003] To this end, it has as a goal an intervertebral stabilizing device, designed to connect two adjacent vertebrae, characterized in that it comprises an upper stop element integral with an upper vertebra, as well as a lower stop element integral with a lower vertebra, these extra-discal stop elements possessing mutual support surfaces adapted to allow mutual rotation of said upper and lower vertebrae around the transverse and sagittal axes of the patient, as well as to prevent mutual rotation of these two vertebrae around a vertical axis; in addition, these support surfaces being adapted to allow mutual translation of these vertebrae in a single direction along the sagittal axis, to allow translation between these two vertebrae in both directions along the vertical axis and to prevent translation between these two vertebrae in both directions along the transverse axis.

[0004] According to other characteristics of the invention:

[0005] one of the stop elements comprises two flat support surfaces, arranged on both sides of the vertical axis, these two surfaces extending obliquely and interacting with two spheres with which the other elements are provided;

[0006] in addition, the device comprises at least one upper pedicular screw, as well as at least one lower pedicular screw, each stop element being integral with at least one of said pedicular screws;

[0007] each stop element is integral with both pedicular screws, respectively upper and lower;

[0008] means are provided for adapting transverse dimensions of each stop element, especially at least one oblong receiving lumen of a pedicular screw;

[0009] means are provided for selectively interlocking each stop element in translation with at least one pedicular screw;

[0010] in addition, the device comprises an extradiscal organ arranged at the back of the intervertebral space, appropriate for absorbing displacement between said vertebrae at least in the direction of intervertebral flexion;

[0011] in addition, the device comprises at least one intersomatic implant, designed to be inserted at least partially between the vertebral bodies of the two neighboring vertebrae.

[0012] The invention will be described below, in reference to the attached drawings, given only by way of nonlimiting examples and in which:

[0013] FIG. 1 is a lateral diagrammatic view, illustrating two adjacent vertebrae between which is placed a stabilizing device in conformance with the invention;

[0014] FIG. 2 is a perspective view, illustrating the device of FIG. 1; and

[0015] FIGS. 3 to 5 are top views, illustrating the device of FIG. 1, as well as two embodiment variants.

[0016] FIG. 1 represents two vertebrae, upper 2 and lower 2′, respectively, which are connected through a stabilizing device in conformance with the invention. Each vertebra comprises a vertebral body 4,4′ extended by a pedicle 6,6′ and the intervertebral space is designated by 12. Note that the patient has undergone removal of the major part of his posterior intervertebral articulation.

[0017] As is shown more specifically in FIG. 2, the upper vertebra is provided with two upper pedicular screws 22,24 arranged on both sides of the principal axis of the vertebral column. Moreover, it is provided with two lower pedicular screws 22,24, integral with the lower vertebra and which are arranged approximately below the upper pedicular screws.

[0018] The stabilizing device of the invention comprises an upper stop element 26, including a horizontal branch 28 as well as two vertical branches 30. This branch 28 has two circular holes made in it that are designed for the passage of the shaft of the upper pedicular screws 22,24. The walls of each opening are extended by an axial sheath 29, covering part of the screw. This sheath, which may be derived from material from branch 28, receives a clamping screw 31 adapted to immobilize the stop element selectively in relation to the pedicular screw, along a translation parallel to the principal axis of the latter.

[0019] This device also comprises a lower stop element 34, including a horizontal branch 36 extended at its ends by rods 37 provided with spheres 38. This lower element has two openings made in it that are designed for the passage of the shaft of the two lower pedicular screws 22,24. Similarly to that described above for the upper element, each opening is provided with an axial sheath 29, provided with a screw 31.

[0020] Moreover, as a variant, at least one of the openings may be an oblong lumen. This thus makes it possible to adapt the transverse dimensions of the stop elements at different spaces from the pedicular screws. The horizontal branches 28 and 36 may also have variable lengths, for example by being telescopic.

[0021] Each vertical branch 30 is folded, such that its end has a flat surface 26′ extending obliquely. This indicates that this end is neither parallel to the median transverse axis A, extending from the right to the left of the patient, nor parallel to the median sagittal axis A′, extending from back to front of the patient (FIG. 3). The principal axis D of this flat surface 26′ is parallel to a line D′ passing through the intersection of these two axes A and A′, especially a bisector of these latter.

[0022] Each support surface 26′ interacts with a corresponding sphere 38, along an approximately point contact. In that way, two rotations around axes A and A′ are allowed between the upper and lower stop elements and, doing this, between the two vertebrae 2 and 2′. On the other hand, rotation around the vertical axis A between these two vertebrae is prevented.
Moreover, mutual translation of the two vertebrae 2, 2' along the sagittal axis A' is allowed in a single direction. Thus, the upper vertebra may not be displaced toward the front relative to the lower vertebra, but on the other hand, is free to be displaced toward the back relative to this lower vertebra.

In addition, any mutual translation of the two vertebrae 2, 2' is prevented in both directions along the transverse axis A'. Lastly, mutual translation between these two vertebrae is allowed in both directions along the vertical axis A.

Other arrangements may be proposed. Thus, the upper stop element may be provided with at least one sphere 38', interacting with a vertical branch terminated by an oblique flat surface 36', extending from the horizontal branch 36 of the lower element (FIG. 4). It may require the interaction of both adjacent spherical support surfaces 42,42', each of which belong to a respective stop element (FIG. 5).

By way of additional variant, at least one of the vertical branches 30 may be made, at least partially, from an elastic material, the elasticity of which allows permanent contact between each branch 30 and a corresponding sphere 38. It is also conceivable to make at least one vertical branch from two parts, having a certain mutual displacement in rotation around the principal axis of the branch. This displacement possibility may be temporary for setting up two stop elements, or permanent to ensure angular adaptation between the branch and the sphere at each instant.

It is possible to provide a single vertical branch 30, interacting with a single sphere 38, especially in the case where part of the natural postural articulation has not been destroyed.

Moreover, the two adjacent vertebrae 2,2' are connected by means of an absorbing organ 40, which is attached to the two free ends of the pedicular screws 22 and 22'. The absorbing organ is for example in conformance with the disclosure of FR-A-2 676 911 or even that of FR-A-2 751 864. It may also comprise a liganent in conformance for example with the disclosure of FR-A-2 694 182.

This extra-discal absorbing organ is appropriate for absorbing a displacement between the two adjacent vertebrae at least in the direction of the intervertebral flexion, in which the patient leans forward toward the front.

The invention is not limited to the examples described and represented.

The proposal may also be made for housing and intersomatic implant, which may be partial or total, in the intervertebral space 12. In the case where it is a partial implant, several implants of this type may be arranged between the same two vertebrae.

Such an implant may be put in position either by the anterior route or by the posterior route, by screwing or even by impaction.

The invention makes it possible to realize the previously mentioned objectives.

In the case of degenerative pathology of the intervertebral disk, extending to the nerves that are adjacent to it, it is necessary for the surgeon to free the nerve root thus compressed. For this purpose, the corresponding operation induces at least partial destruction of the posterior intervertebral articulation.

The device of the invention to a great extent makes it possible to restore the posterior stability which had appreciably decreased because of the surgery. In addition, it allows relative movement between the two neighboring vertebrae that is very close to natural movement. In this regard, combining two extra-discal stop elements with an extra-discal absorbing organ is quite specifically advantageous.

Proposing that each upper or lower element is mounted on two pedicular screws at the same time makes it possible to prevent these screws from being disconnected relative to the vertebral bodies that receive them. In fact, in this case, the pedicular screws are not subjected to any rotation around their principal axis.

1. Intervertebral stabilizing device designed to connect two adjacent vertebra (2,2') characterized in that it comprises an upper stop element (26), integral with an upper vertebra (2) as well as a lower stop element (34) integral with a lower vertebra (2), these extra-discal stop elements (26,34) possessing mutual support surfaces (26,38; 36,38; 42,42') adapted to allow mutual rotation of said upper (2) and lower (2) vertebrae around transverse (A) and sagittal (A') axes of the patient, as well as to prevent mutual rotation of these two vertebrae around a vertical axis (A), these support surfaces in addition being adapted to allow mutual translation of these vertebrae in a single direction along the sagittal axis (A'), to allow translation between these two vertebrae in both directions along the vertical axis (A) and to prevent translation between these two vertebrae in the two directions along the transverse axis (A), a first (26,34) of said stop elements having at least one support surface on one side of the vertical axis (A) and the other (34,26) of said stop elements having at least one support surface on the same side of the vertical axis (A) which interacts with the first stop element (26,34), at least one of the said support surfaces (38,38; 42,42) having a spherical external shape.

2. Device according to claim 1 characterized in that each of said stop elements (26,34) includes two support surfaces (26,38; 36,38; 42,42) arranged on both sides of said vertical axis (A).

3. Device according to claim 2 characterized in that one of said stop elements comprises two flat support surfaces (26') arranged on both sides of the vertical axis (A), these two surfaces extending obliquely and interacting with two spheres (38) with which the other of said parts is provided.

4. Device according to claim 1 or 2 characterized in that said support surfaces (42,42) are spherial.

5. Device according to one of claims 1 to 4 characterized in that in addition it comprises at least one upper pedicular screw (22,24) as well as a lower pedicular screw (22,24), each stop element (26,34) being integral with at least one of said pedicular screws.

6. Device according to claim 5 characterized in that each stop element (26,34) is integral with two pedicular screws, respectively upper (22,24) and lower (22,24).

7. Device according to claim 6 characterized in that it is provided with means for adapting transverse dimensions of each stop element, especially at least one oblong receiving lumen of a pedicular screw.
8. Device according to one of claims 5 to 7 characterized in that it is provided with means (31,31') allowing each stop element to be selectively interlocked in translation with at least one pedicular screw.

9. Device according to one of the preceding claims characterized in that it comprises in addition an extra-discal organ (40) arranged at the back of the intervertebral space (12) appropriate for absorbing displacement between said vertebrae (2,2) at least in the direction of the intervertebral flexion.

10. Device according to any one of the preceding claims characterized in that in addition it comprises at least one intersomatic implant, designed to be inserted at least partially between the intervertebral bodies of the two adjacent vertebrae.

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